CLAIMS

1. A nitride semiconductor light-emitting device comprising: a substrate; a layered portion emitting light disposed on the substrate, the layered portion including an n-type semiconductor layer, an active layer, and a p-type semiconductor layer; and an n electrode,

wherein the layered portion has an inclined periphery at which the surface of the n-type semiconductor layer is exposed, and the n electrode is disposed on the surface of the n-type semiconductor layer.

2. The nitride semiconductor light-emitting device according to Claim 1, wherein the n electrode surrounds the layered portion.

3. The nitride semiconductor light-emitting device according to Claim 1 or 2, wherein the n electrode continuously extends to the lower surface of the substrate through the side surfaces of the substrate.

4. The nitride semiconductor light-emitting device according to any one of Claims 1 to 3, wherein the layered portion has a circular shape.

5. The nitride semiconductor light-emitting device according to any one of Claims 1 to 3, wherein the layered portion has a hexagonal shape.

6. The nitride semiconductor light-emitting device according to any one of Claims 1 to 5, wherein the nitride

semiconductor light-emitting device has a plurality of the layered portion emitting light.

7. The nitride semiconductor light-emitting device according to Claim 6, wherein the respective n-electrodes for the layered portions are connected to each other to define a common electrode.

8. The nitride semiconductor light-emitting device according to Claim 7, wherein the layered portions have respective p ohmic electrodes in ohmic contact with the respective p-type semiconductor layers, and the p ohmic electrodes are connected to each other.

9. The nitride semiconductor light-emitting device according to any one of Claims 1, 2, and 4 to 8, further comprising a reflection layer covering the layered portion.

10. The nitride semiconductor light-emitting device according to Claim 9, wherein the reflection layer is of a metal layer covering the layered portion with an insulating layer therebetween.

11. The nitride semiconductor light-emitting device according to Claim 10, wherein the metal layer serves as a connecting electrode for connecting the p ohmic electrodes of the p-type semiconductor layers of the layered portions.

12. The nitride semiconductor light-emitting device according to Claim 9, wherein the reflection layer comprises a dielectric multilayer film.

13. The nitride semiconductor light-emitting device according to any one of Claims 1 to 12, wherein the inclined periphery has a convex surface protuberating outward.

14. A nitride semiconductor light-emitting device comprising: an n-type nitride semiconductor layer; p-type nitride semiconductor layer; and a luminescent layer formed of a nitride semiconductor between the n-type nitride semiconductor layer and the p-type nitride semiconductor layer,

wherein at least the p-type nitride semiconductor layer and the luminescent layer define a frustum layered composite, and the layered composite is embedded in a metal member so that the periphery of the layered composite is isolated.

15. A nitride semiconductor light-emitting device comprising: an n-type nitride semiconductor layer; p-type nitride semiconductor layer; and a luminescent layer formed of a nitride semiconductor between the n-type nitride semiconductor layer and the p-type nitride semiconductor layer,

wherein at least the p-type nitride semiconductor layer and the luminescent layer define a frustum layered composite, and the layered composite is supported by a metal member opposing the surface of the layered composite.

16. The nitride semiconductor light-emitting device according to Claim 1 or 2, wherein the surface of the metal member opposite to the surface opposing to the layered composite is flat.

17. The nitride semiconductor light-emitting device according to any one of Claim 1 to 3, further comprising a transparent electrode on one of two opposing surfaces of the n-type nitride semiconductor layer, and the other surface has the layered composite.

18. The nitride semiconductor light-emitting device according to Claim 4, wherein the transparent electrode comprises ITO.

19. The nitride semiconductor light-emitting device according to any one of Claims 1 to 5, further comprising a p electrode containing Rh, the p electrode being disposed between the layered composite and the metal member to establish an ohmic contact with the p-type nitride semiconductor layer.

20. The nitride semiconductor light-emitting device according to any one of Claims 1 to 6, wherein the layered composite includes part of the n-type nitride semiconductor layer.

21. The nitride semiconductor light-emitting device according to any one of Claims 1 to 6, wherein the layered composite includes the entire n-type nitride semiconductor layer.

22. The nitride semiconductor light-emitting device according to any one of Claims 1 to 8, wherein the metal member has a thickness of 50 μm or more.

23. The nitride semiconductor light-emitting device according to any one of Claims 1 to 9, wherein the nitride semiconductor light-emitting device has a plurality of the

layered composite.

24. The nitride semiconductor light-emitting device according to Claim 10, wherein the n-type nitride semiconductor layer is common to the plurality of the layered composites and the layered composites are disposed on the common n-type nitride semiconductor layer.

25. The nitride semiconductor light-emitting device according to Claim 10, wherein the layered composites have the respective n-type nitride semiconductor layers.

26. The nitride semiconductor light-emitting device according to any one of Claims 1 to 12, wherein the metal member comprises a metal or an alloy containing the metal, the metal being selected from the group including Ti, Ag, Al, Ni, Pt, Au, Rh, Cu, and W.

27. A method for manufacturing a light-emitting device, comprising:

the first step of forming an n-type semiconductor layer, a luminescent layer, and a p-type semiconductor layer on a substrate;

the second step of forming frustum luminescent regions including the p-type semiconductor layer and the luminescent layer;

the third step of forming a metal member so as to cover the luminescent layer;

the fourth step of removing the substrate; and

the fifth step of cutting the metal member between the luminescent regions to separate light-emitting devices from one another.

28. The method for manufacturing a light emitting device according to Claim 14, wherein in the third step, the metal member is formed by plating.

29. A semiconductor light-emitting device comprising a structure including a first conductivity type layer; a second conductivity type layer; and a luminescent layer between the first and second conductivity type layers,

wherein at least part of the structure defines a structured portion having a lower surface with a width in sectional view, an upper surface with a smaller width than the width of the lower surface in sectional view, and a inclined periphery, and

wherein the periphery is defined by first side surfaces, each having a width increasing from the lower surface side toward the upper surface side, and second side surfaces, each having a width increasing from the upper surface side toward the lower surface side.

30. The semiconductor light-emitting device according to Claim 29, wherein the first side surfaces are formed in the corners defined by the sides of the lower surface.

31. The semiconductor light-emitting device according to Claim 29, wherein the luminescent layer is disposed inside the structured portion.

32. The semiconductor light-emitting device according to Claim 29, wherein the lower surface has a square or polygonal shape, the second side surfaces are formed on the sides of the lower surface, and the first side surfaces are formed in the corners of the lower surface.

33. The semiconductor light-emitting device according to Claim 29, wherein the structured portion is of frustum.

34. The semiconductor light-emitting device according to Claim 29, wherein the first side surfaces are curved to be convex outward.

35. The semiconductor light-emitting device according to Claim 29, wherein the first side surfaces define rounded sides of the lower surface and the upper surface, and the curvature radius of the rounded sides of the upper surface is larger than that of the lower surface.

36. The light-emitting device according to Claim 29, further including an electrode structure, wherein the light-emitting device has a plurality of the structured portion, and the electrode structure is provided so that the structured portions substantially simultaneously emit light.

37. The light-emitting device according to Claim 29, further comprising a pair of a positive electrode and a negative electrode on the same surface side over the upper surface of the structured portion.

38. The light-emitting device according to Claim 37,

wherein one of the pair of the electrodes covers part of the periphery of the structured portion.

39. The light-emitting device according to Claim 29, wherein the light-emitting device has a plurality of the structured portion separately disposed on a substrate, and further includes electrodes disposed so that the structured portions substantially simultaneously emit light.

40. The light-emitting device according to Claim 37, wherein the upper surface of the structured portion defines a mounting surface which opposes a mounting base when the light-emitting device is disposed on the mounting base, and wherein one of the pair of the electrodes is disposed on a substrate, and the other comprises a wiring structure disposed on the mounting base side so as to be connected to the upper surfaces of the separately disposed plurality of the structured portions.

41. The light-emitting device according to Claim 29, further comprising a pair of electrodes disposed separately on the upper surface side of the structured portion and on the lower surface side, wherein the pair of the electrodes are respectively disposed on the surface of the first conductivity type layer and the surface of the second conductivity type layer.

42. The light-emitting device according to Claim 41, further comprising a light-transmissive insulating layer covering the periphery of the structured portion; and a filling member around the periphery with the light-transmissive insulating layer

therebetween.

43. The light-emitting device according to Claim 41, wherein the light-emitting device has a plurality of the structured portion, and the structured portions are separated from one another by a protruding filling member.

44. The light-emitting device according to Claim 42, wherein the luminescent layer is disposed inside the structured portion, and the filling member protrudes below the luminescent layer toward the lower surface side of the structured portion.

45. A light-emitting apparatus comprising: the light-emitting device as set forth in any one of Claims 29 to 44; and a mounting portion on which the light-emitting device is placed, wherein the light emitting device is mounted on a support and then placed on the mounting portion.

46. The light-emitting apparatus compositing: the light-emitting device as set forth in any one of Claims 29 to 44, and a light-transforming member for transforming part of light emitted from the light-emitting device into light having a different wavelength.

47. The light-emitting apparatus according to Claim 45 or 46, wherein the light-transforming member comprises an aluminum garnet phosphor containing Al; at least one element selected from the group consisting of Y, Lu, Sc, La, Gd, Tb, Eu, and Sm; one of Ga and In, and at least one element selected from the rare earth elements.

48. The light-emitting apparatus according to Claim 45 or 46, wherein the light-transforming member comprises a phosphor expressed by $(Re_{1-x}R_x)_3(Al_{1-y}Ga_y)_5O_{12}$ ($0 < x < 1$ and $0 \leq y \leq 1$, wherein Re represents at least one element selected from the group consisting of Y, Gd, La, Lu, Tb, and Sm; and R represents Ce or Ce and Pr).

49. The light-emitting apparatus according to Claim 45 or 46, wherein the light-transforming member comprises a nitride phosphor containing N; at least one element selected from the group consisting of Be, Mg, Ca, Sr, Ba, and Zn; and at least one element selected from the group consisting of C, Si, Ge, Sn, Ti, Zr, and Hf, and is activated by at least one element selected from the rear earth elements.

50. The light-emitting apparatus according to Claim 45 or 46, wherein the nitride phosphor is expressed by the general formula $L_XSi_YN_{(2/3X + 4/3Y)}:Eu$ or $L_xSi_YO_zN_{(2/3X + 4/3Y -2/3Z)}:Eu$ (L represents Sr, Ca, or Sr and Ca).